

was rendered tedious by the abruptness of the ascent. Having completed these observations, it occurred to the Astronomer Royal that the instruments employed in the survey might be used as a means of verifying the correctness of the horizontal point of the mural circles. The coincidence of the horizontal wires of the two instruments was found to be so nearly perfect, as to agree within a few hundredths of a second. From Greenwich the levelling was continued on the opposite side of the river to different places where tide-registers had been kept. By the kindness of Mr. Lubbock, the author was furnished with the results of twenty-six years' observations on the tides at the London Docks; from which it appears, that the height of mean high-water mark there, above that at Sheerness, is 2.24 feet and the height of spring tide high-water mark 2.03, and of neap tides 2.35. The Trinity mark on the western side of Old London Bridge is 2.16 feet below the north standard mark at Sheerness, and 1.9 foot above the mean spring tide high-water mark at Sheerness.

The author concludes by giving a long catalogue of standard marks and other points of reference between Sheerness and London Bridge, the north standard at Sheerness being taken as the zero point.

In the course of his observations he found reason to believe that the tremulous appearance of the air which has been termed *mirage*, is caused, not so much by evaporation as by the direct effect of the solar rays: for he remarked, that when there was a succession of clouds passing over the sun, the tremor was very great at those times when the sun shone; but the moment the sun was obscured over the whole space between the instrument and the object viewed, the air was perfectly tranquil.

March 10.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX,
President, in the Chair.

Alexander Caldecleugh, Esq. and John Carnac Morris, Esq. were elected Fellows of the Society.

The following Presents were received, and thanks ordered for them:—

An Engraved Portrait of Davies Gilbert, Esq. V.P.R.S. Engraved by Cousins from a painting by Howard.—*Presented by John Guillemond, Esq. F.R.S.*

Notices of the Proceedings of the Zoological Society. (Jan. 25 to Feb. 8, 1831.) 8vo.—*The Society.*

It being stated to the Meeting by the President that Mr. Caldecleugh, elected that evening, was on the point of leaving England for Mexico, and would consequently have no other opportunity during this session of attending for admission, Mr. Caldecleugh was allowed to sign the Obligation in the Charter Book, and was admitted a Fellow of the Society.

A Paper was read, entitled, "Description of a Graphical Register of Tides and Winds." By Henry R. Palmer, Esq., Civil Engineer. Communicated by J. W. Lubbock, Esq. V.P. & Treas. R.S.

The author having long directed his attention to the effects likely to be produced on the tides in the river Thames, in the port of London, by the removal of London Bridge, was desirous of obtaining a series of accurate observations during all the changes of the tides; and for this purpose constructed a machine, which, being acted upon jointly by a time-piece and by a float resting on the water, registered of itself, upon a piece of paper, both the height of the tide, and the direction of the wind.

A number of parallel and equidistant lines, representing feet in height, are engraved and printed on long sheets of paper, the ends of which are joined together until a sufficient length is obtained for the purpose required. This long sheet is wound upon a brass roller, which is placed near the lower part of a cylinder one foot in diameter, so that the paper may pass round it; its contact being preserved by a roller above, pressing upon it by its own weight. On the axis of the cylinder is a toothed wheel, which is acted upon by a clock, producing an equable motion in the cylinder, which is thus made to complete one revolution in six hours. By means of another wheel, at the expiration of every hour a hammer is raised, whose fall strikes on an upright punch connected with a weather-cock on the top of the building; and the figure of an arrow being cut on the lower end of this punch, an impression of the arrow is made upon the paper: as the direction of the arrow always corresponds with that of the wind, the direction of the latter is thus hourly registered.

Immediately over the axis of the cylinder, and parallel with it, is a rack carrying a pencil. The rack is acted upon by a pinion, which receives its motion from the float on the water: so that as the tide rises or falls, the pencil is moved backwards and forwards through a space which bears a determinate ratio to the actual rise or fall of the float: and thus, by the combined motions of the cylinder and of the pencil, the one regulated by the clock and the other by the tide, a line is traced on the paper, giving a representation of both.

The float, which rests on the water, is a hollow plate-iron vessel, suspended by a chain, which passes twice round a light cast-iron barrel, and then descends, having a counter weight attached to it. The float is placed in a well communicating with the river, through a fine wire gauze, which prevents the undulations of the surface from affecting the water in the well.

The author concludes by an account of an application of similar machinery to the determination of the precise times of high water, and the construction of accurate tide tables. He proposes, with this view, an instrument which shall record the height of the tide at every minute, and promises to give to the Society a full description of such a machine when it shall have been completed.

His Royal Highness then addressed the Meeting, informing them that by the express command of His Majesty, He, together with the